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COMPUTER ABSTRACTS

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GENERAL

840 **The characteristics of computers of the second decade—continued.** D. Hooper, *Computer Bull.*, **4,** March 1961, 145-149. Continued from *ibid,* **4,** Dec. 1960, 87 (*C.A.*, **5,** Feb. 1961, Ref. 206), this article reports the discussion on the paper "The characteristics of computers of the second decade. A review", D. E. Kilner, *ibid,* **4,** Dec. 1960, 88-112 (*C.A.*, **5,** Feb. 1961, Ref. 360). A lengthy contribution from A. D. Booth is generally critical of the novelty of the advances reviewed in the paper. This is followed by some brief replies by representatives of eight British computer manufacturers to points made by Dr. Booth or Miss Kilner. Finally, an extensive general discussion is reported.

841 **Reliability: computers versus humans.** D. A. Bell, *Computer Bull.*, **4,** March 1961, 140. It is pointed out that in certain on-line control tasks, such as air traffic control, the main impediment to the introduction of computers is that their liability to failure is much higher than that of unpredicted catastrophic failure of a human operator. The question is considered as to whether the reliability of computers can be raised by several orders of magnitude by some system of redundancy. The proposal to use three computers on a "best out of three" basis is examined and it is concluded that theoretically a triplication of individual components would achieve greater reliability than the use of three complete machines. 4 refs.

842 **The reliability of mechanical engineering parts of data processing systems.** D. P. Kilner, *Computer Bull.*, **4,** March 1961, 151-154. Report of an informal discussion under the above title held on 5th January 1961 at the Institution of Mechanical Engineers. The general thesis before the meeting was that the standard of reliability of the mechanical engineering parts of data processing systems was 10 to 100 times below that required by users and that there was a general disparity of reliability between the electronic and mechanical parts.

843 **Human factors considerations in the design of electronic computers.** R. O. Lucier and E. J. Parker, University of Pennsylvania, *PB 153596*, 30 June 1960, 53 p. The necessity of considering the human element in the design of computer equipment, especially in the design of the operators' consoles for the FIELDATA equipment family is discussed. The main text is divided into three sections, which are concerned with the design of operators' consoles, the use of human factors by producers of electronic computers, and the consideration of the human component of man-machine relationships in the area of automatic data processing systems. Several arguments are put forth, one of which is the need to standardise various aspects of design in the control panels of consoles. Another fact that the author points out is the problem of ADP personnel—the growing need for programmers and the dwindling source of manpower, the high production of computers and the inability to find enough personnel to handle them. An appendix is concerned with various aptitude and psychological tests administered to people in ADP systems. It discusses and compares the tests and the results of such tests. 8 refs.

DESIGN

844 **Cryotron decoding or selecting matrix.** M. K. Haynes, *IBM Technical Disclosure Bull.*, 3, March 1961, 118-19. Description of a selection matrix of cryotrons for selectively applying current to drive lines of a data storage matrix.

845 **Cryotron storage, arithmetic and logical circuits.** M. K. Haynes, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 396-412. This paper discusses, with circuit examples, how certain unique characteristics of cryotrons make possible new and simpler forms of storage, arithmetic and logical circuitry. The characteristics of cryotrons which are unique among those of control, storage and logic devices are: absolute zero resistance of the superconducting state, the concomitant lack of attenuation of propagating signals, persistent current storage, simplicity and versatility in logic, low power and energy levels, small size and projected low cost.

846 **Direct coupled transistor-Esaki diode logic.** A. J. Gruodis and P. H. Bardell, *IBM Technical Disclosure Bull.*, **3,** March 1961, 94. Description of logic circuitry in which transistors are connected to a single Esaki diode to give low impedance output with low power dissipation and a large available output current.

847 **Error-check of mode encoder.** A. Rae, *IBM Technical Disclosure Bull.*, **3,** March 1961, 59. Brief description of circuitry which provides an error indication whenever an input pulse entering one of several flip-flops results in the issuance of an improperly coded output command pulse.

848 **Error detection circuit.** P. J. Kosteva, *IBM Technical Disclosure Bull.*, **3,** March 1961, 47-48. Description of an error detection circuit for checking serial digital data during transfer. Checking is done on an odd-even bit count basis and requires that each word has a parity bit attached to it.

849 **Hybrid ring logic.** G. E. Hoernes, *IBM Technical Disclosure Bull.*, **3,** March 1961, 57-58. Description of hybrid rings in tree configuration to provide multi-input majority information in a logic system where phase is the data-bearing variable.

850 **Limitations of the AND-OR to majority-logic conversion technique.** C. W. Sutherland, *Proc IRE,* **49,** Feb. 1961, 519. Letter referring to "A new concept in computing", R. Lindaman, *ibid,* **48,** Feb. 1960, 257 (*C.A.* **4,** August 1960, Ref. 1399), and demonstrating that the method there described for converting logical networks containing AND and OR functions to networks containing only majority decision elements is applicable to only 10 of the 256 possible switching functions of three variables.

851 **Logic circuitry.** W. Mayeda, *IBM Technical Disclosure Bull.*, **3,** March 1961, 74-75. Description of a circuit for performing logical operations which includes a pair of Esaki diodes connected in series from a positive voltage supply to earth. By adjusting a resistor across one diode, various logical functions can be realised. See also Refs. 852 to 855.

852 **Logical circuit.** W. Mayeda, *IBM Technical Disclosure Bull.*, **3,** March 1961, 76. A logical circuit used to obtain the negation function comprises a pair of Esaki diodes and a resistor connected in series between a positive voltage supply and earth. See also Refs. 851, 853, 854 and 855.

853 **Diode circuit.** W. Mayeda, *IBM Technical Disclosure Bull.*, **3,** March 1961, 77. Describes a circuit employing three Esaki diodes which is an improvement on the circuit of Ref. 852. See also Refs. 851, 854 and 855.

854 **Esaki diode circuitry.** W. Mayeda, *IBM Technical Disclosure Bull.*, **3,** March 1961, 78. Describes a circuit employing four Esaki diodes which is an improvement on the circuit of Ref. 852. See also Refs. 851, 853 and 855.

855 **Esaki diode logical circuits.** W. Mayeda, *IBM Technical Disclosure Bull.*, **3,** March 1961, 79-80. Description of a circuit employing three Esaki diodes which provides the negation function. See also Refs. 851 to 854.

856 **Mutistable core counter sensing.** R. L. James and T. A. Lassetter, *IBM Technical Disclosure Bull.*, **3,** March 1961, 99-100. Description of an arrangement in which one core and its associated circuitry act as a blocking oscillator to supply a second core with constant volt-second pulses.

857 **N-valued logic circuit.** H. B. Baskin, *IBM Technical Disclosure Bull.*, **3,** March 1961, 81. Description of an *n*-valued logic circuit which can be used as an analogue-to-digital converter and is composed of negative resistance circuits. The circuit can also be used for *n*-valued storage and to perform other logical operations.

858 **Noise discriminator.** R. E. Thome, *IBM Technical Disclosure Bull.*, **3,** March 1961, 63. Description of a circuit which discriminates between data and noise signals in the output winding of a two-core-per-bit memory.

859 **Non-destructive readout for thin film memory.** J. J. Coughlin and C. W. Williams, *IBM Technical Disclosure Bull.*, **3,** March 1961, 71. Brief description of how local amplification of Hall effect non-destructive readout of a ferromagnetic thin film memory cell is provided by depositing a transistor on the cell and utilising a Hall element as the emitter of the transistor. The direction of magnetic flux through the emitter controls the polarity of the Hall voltage so as to add to or subtract from the emitter-base bias of the transistor.

860 **A one-zero and blank detector.** E. F. Yhap. *IBM Technical Disclosure Bull.*, **3,** March 1961, 83. Brief description of a transistorised detector used in asynchronous systems in which binary data is represented by a positive pulse for a "1" and a negative pulse for an "0". A unipolar output is provided for each bit of information.

861 **A plus-one circuit.** E. F. Yhap, *IBM Technical Disclosure Bull.*, **3,** March 1961, 82. Brief description of how a circuit for adding one to any number can be implemented by the use of Rutz commutating transistors so that the plus-one function for any number of digits can be obtained, each digit requiring only one additional device. The circuit is useful in constructing an address ring where an address must be increased by one sequentially.

862 **Selective pulse control system.** S. H. Pitkowsky and G. T. Paul, *IBM Technical Disclosure Bull.*, **3,** March 1961, 60. In some instances the time interval between the end of a required operation time and the next clock pulse which samples the result into the succeeding operation is greater than one-half of a clock cycle. Appreciable time is saved by selecting the opposite phase of the clock for sampling the results and starting the next operation. Circuitry for this purpose is described.

863 **A visual-matrix method for minimizing Boolean functions.** A. D. Zakrevski, *Automn. and Remote Control* (Automatika i Telemekhanika in English), **21,** March 1960, 255-258. This paper describes, with examples, a visual matrix method of minimising Boolean functions, which is semi-algorithmic, semi-intuitive. It is applicable to the minimisation of arbitary Boolean functions with up to 10 to 12 variables, and is particularly effective for the minimisation of incompletely defined functions. 20 refs.

864 **Circuits and components improvement program, ECPX 0002.** Int. Business Machines Corp., *PB 153274,* 1 Jan. 1958, 52 p. Contents: Circuits and components improvement program; Transistor component evaluation and circuit design; Magnetic core and core circuit development; Semiconductor component development and application; Printed circuits and components; Component reliability study; Tabulated results.

865 **Current operated diode logic gate.** H. Reinecke, M.I.T., *PB 152750,* 21 July 1960, 43 p. The realisation of switching functions using current operated diode logic gates, which employ the direction of current as the binary variable, is presented. Two realisation methods are discussed. The dual method consists of a set of rules which are analogous to the procedures employed for the realisation of voltage operated circuits. The lattice method is based on the transmission characteristics of a lattice network of four series-connected diodes. Hybrid networks, which combine the advantages of both methods, are described to illustrate the versatility of current operated techniques. Practical design procedures are included to guide the designer in the application of the realisation rules. A static multiplier capable of simultaneously multiplying two 4-bit binary numbers, was designed and built to demonstrate the practicability of current operated diode logic gates. Dynamic tests indicated a reliable capability of 333,000 multiplications per second. 9 refs.

866 **Research directed toward design and development of experimental data processing equipment.** M. W. Woodruff, Lockheed Electronics Co., *PB 152935,* Nov. 1960, 96 p. The report refers to a laboratory which houses a complex data processing system, and is essentially a simulation facility designed for the purpose of conducting studies in the field of aerospace surveillance on problems which may be experienced at any command and control level. This report describes the technical improvements and engineering developments which have contributed to improved operational reliability and flexibility and which have enhanced the system's capability to simulate operational problems. 12 refs.

867 **Arithmetic circuitry.** Standard Telephones & Cables Ltd., *B.P. 861926,* 1 March 1961. A selector circuit for use, for example, in the arithmetic unit of a digital computer, selects outputs representing symmetrical functions of two inputs and employs a matrix of AND gates.

868 **Parity bit generator.** Nat. Cash Register Co., *B.P. 862281,* 8 March 1961. This patent is concerned with a parity bit generator in which parallel bit signals are supplied to certain inputs of comparators; other inputs of the comparators are supplied from outputs of other comparators and the output of one comparator provides the parity bit.

869 **Data handling circuit.** Soc. d'Electronique et d'Automatisme, *B.P. 863069,* 15 March 1961. This patent is concerned with the magnetic core circuit described in *B.P. 825949* (*C.A.* **4,** Feb./March 1960, Ref. 309). According to the present patent, each input winding is connected through a capacitor and an additional core to an output winding on another core.

870 **Driving circuitry for a magnetic core matrix.** Int. Business Machines Corp., *B.P. 863153,* 15 March 1961. This patent describes a driver matrix employing magnetic cores to provide read and write current pulses for a magnetic core storage matrix.

871 **Digital computer error diagnosis.** Telefunken G.m.b.H., *B.P. 863344,* 22 March 1961. A digital computer is provided with a monitoring system for error diagnosis which derives an analogue voltage from the order counter and/or address register and uses the voltage to display variations in time of the state of the counter and/or register.

872 **Matrix driving circuitry.** Sylvania Electric Products Inc., *B.P. 864174,* 29 March 1961. A drive circuit, especially for coincident current magnetic core matrices, comprises for each output circuit, a transformer with two primaries connected respectively in two switching matrices and which induce currents in opposite senses in the secondary of the transformer.

873 **Digital delay circuit.** Elliott Brothers (London) Ltd., *B.P. 864304,* 29 March 1961. In a circuit for delaying digital data, data is read from a first magnetic core into a second core with temporary storage by a transistor.

874 **Superconductive switching circuitry.** Int. Business Machines Corp., *U.S.P. 2958848,* 1 Nov. 1960. A switch of cross point type is provided by two sets of conductors, each member of one set being individually connected to each member of the other set by a superconductive element. Each superconductive element is controlled by the magnetic field produced by a persistent current in an adjacent superconductive path.

875 **A.C. analogue computer circuit.** U.S. Secretary of the Army, *U.S.P. 2961610,* 22 Nov. 1960. Integration of the modulation on an amplitude modulated carrier is effected with a circuit employing a reflected nonlinear modulator.

See also:—
General, Ref. 843.
Applications: Electronics, Ref. 1038.

LEARNING AND PATTERN RECOGNITION

876 **Finite automata. I** and **II.** M. A. Aizerman, L. A. Gusev, L. I. Rozonoer, I. M. Smirnova and A. A. Tal', *Automn. & Remote Control* (Automatika i Telemekhanika in English), **21,** Feb. 1960, 156-163 and March, 1960, 248-254. In Part I, after presenting basic definitions and terminology for the theory of finite automata, general problems arising in connection with finite automata are considered. Attention is then directed to mappings of finite automata and their equivalence and the abstract assembly of a finite automaton is discussed. 25 refs. In Part II, the problem of constructing automata operating in one time scale from automata operating in another time scale is discussed, and two methods are given for constructing automata by transformation of time scales. Abstract neurons and neuron nets are considered and their realisation with relay contact circuits is discussed.

877 **Suggestions for self-adapting computer models or brain functions.** L. Uhr and C. Vossler, *Behavioral Science,* **6,** Jan. 1961, 91-97. This paper puts forward a suggestion for a general purpose computer (or brain model) that is not designed for any specific input-operator-output space but will learn to adapt and compose itself into an appropriate model for operating upon any space presented to it. Some results are reported for a pattern recognition program for the IBM 709 that uses this approach. An approach to language learning by computers through the recognition of redundant patterns is then outlined. Finally, a very simple basic unit—a self-adaptive neural net—that appears to be plausible from a neurophysiological standpoint and easily realised with logical circuitry of the sort used in computers is described. 21 refs.

878 **Character recognition.** D. A. Bell, Birmingham University, *PB 152926,* 1960, 25 p. Contents: Correlation detection of five-unit code signals; Correlation recognition of the printed numerals 0 to 9; Mosaic reader. 6 refs.

879 **Finite automata, pattern recognition and perceptrons.** H. Keller, New York University, *NYO-2884,* March 1960, 50 p.

880 **Linear bounded automata.** J. Myhill, University of Pennsylvania *PB 171339,* June 1960, 29 p. This report presents a new concept, that of a linear bounded automaton. Such automata can do more than finte automata, but cannot do as much as Turing machines. A full discussion of the concept is given, followed by a proof that all classes of tapes of a certain kind are representable by linear bounded automata. The report concludes with a proof that all classes of tapes representable by linear bounded automata are primitive recursive. 6 refs.

881 **Recognition of handwritten characters.** Lamson Paragon Ltd., *B.P. 863431,* 22 March 1961. Handwritten numerals or other characters are identified by apparatus in which a different circuit is actuated for each up, down, left and right movement made by an instrument in writing a character and a signal is produced in a circuit distinctive of the written character.

882 **Character recognition.** K. R. Eldredge and M. D. Marsh, *U.S.P. 2961649,* 22 Nov. 1960. This patent is concerned with an automatic reading system for characters printed in five parallel lines in magnetic ink with a different number of lines per unit length for different characters. Signals derived from the characters are passed through filters tuned to different passbands.

MATHEMATICS

883 **Alternating direction iteration for mildly nonlinear elliptic difference equations.** J. Douglas, *Numerische Mathematik,* **3,** 24 March 1961, 92-98. This paper introduces a modification of the usual alternating-direction procedures and shows that the iteration converges for the Dirichlet difference problem for

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = Q(x, y, u), \quad (x, y) \in R,$$

where R is a rectangle, under certain assumptions on $\partial Q / \partial u$. The technique involves a two-level iteration. The outer iteration is a modified Picard iteration and the inner iteration is alternating direction. 11 refs.

884 **A further generalization of the Kantorovic inequality.** F. L. Bauer, *Numerische Mathematik,* **3,** 24 March 1961. 117-119. This paper derives inequalities which amount to a generalisation of the Kantorovic inequality in a certain direction: bounds are given for the euclidean bound norm (the greatest singular value) of certain matrices of order k, formed from a positive definite matrix M. For $k=1$, the inequality reduces to that of Kantorovic. 4 refs.

885 **The radius of univalence of the function** $\exp z^2 \int_0^z \exp(-t^2) dt$.

Y. L. Luke, *Numerische Mathematik,* **3,** 7 Feb. 1961, 76-78. Two sets of polynomials $\{\pi_n(y)\}$ are developed such that if y_{on} is the smallest zero of $\pi_n(y)$, then $\lim_{n\to\infty} y_{on} = \rho$, the radius of univalence of the function $E(z) = e^{z^2} \int_0^z e^{-t^2} dt$. 4 refs.

886 **Some extensions of Bairstow's method.** H. E. Salzer, *Numerische Mathematik,* **3,** 24 March 1961, 120-124. This paper presents some extensions of Bairstow's method for improving an approximate real quadratic factor $(x^2\text{-}px\text{-}q)$ of a polynomial with real coefficients which leaves a remainder $r(x)$. Bairstow's method is to determine δp and δq to satisfy

$$O = r(x) + \frac{\partial r(x)}{\partial p}\delta p + \frac{\partial r(x)}{\partial q}\delta q.$$

One extension is to determine δp and δq when the three second-order terms

$$\frac{1}{2}\left[\frac{\partial^2 r(x)}{\partial p^2}(\delta p)^2 + 2\frac{\partial^2 r(x)}{\partial p \partial q}(\delta p)(\delta q) + \frac{\partial^2 r(x)}{\partial q^2}(\delta q)^2\right]$$

are added to the right member. Another extension improves an approximate real quartic factor $(x^4\text{-}px^3\text{-}qx^2\text{-}rx\text{-}s)$, considering only terms of the first order δp, δq, δr and δs. 2 refs.

887 **On the successive over-relaxation method for cyclic operators.** G. Kjellberg, *Numerische Mathematik,* **3,** 24 March 1961, 87-91. The successive over-relaxation method is much used for the solution of certain classes of systems of linear algebraic equations, especially those which are obtained when partial differential equations are approximated by difference equations. Conditions for the convergence of this method may be deduced from a theorem of D. Young. R. S. Varga has generalised Young's theorem to matrices with a cyclic property. This paper carries the generalisation further in the same direction, at the same time using a method of proof which is coordinate-free and thus not restricted to finite-dimensional spaces. 11 refs.

888 **Two new algorithms for rational approximation.** E. W. Cheney and H. L. Loeb, *Numerische Mathematik,* **3,** 7 Feb. 1961, 72-75. Two algorithms, termed the differential correction algorithm and the descent algorithm, for rational approximation are presented. 7 refs.

889 **The approximation of solutions of non-linear differential equations.** M. D. George, University of Maryland, *PB 149730,* March 1960, 16 p. Sufficient conditions are given for the convergency of a sequence of operators to a given semigroup of non-linear operators in a Banach space, with applications to the approximation of solutions of non-linear partial differential equations by finite difference methods. 4 refs.

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890 **On difference methods for the solution of partial differential equations of mixed type.** H. Ogawa, California University, *PB 152715-1,* Oct. 1960, 51 p. This paper is concerned with the problem of solving boundary and initial value problems for certain partial differential equations of mixed type by finite difference methods. Filippov, in considering the Tricomi equation, used a maximum principle as a basis for proving the existence of the solution to a certain difference equation. Filippov's results are extended to a more general mixed-type equation whose difference approximation has a solution which satisfies a maximum principle. It is found that the conditions under which the solution of the differential equation satisfies a maximum principle, as discovered by Agmon, Nirenberg and Protter, are sufficient for the solution of the difference equation to satisfy an analogous principle, except near the parabolic line where additional conditions are required. See also Ref. 891.

891 **On difference methods for the solution of partial differential equations of mixed type.** H. Ogawa, California University, *PB 152715-2,* Oct. 1960, 54 p. Finite difference methods are employed for the solution of an equation which is hyperbolic in the interior of a domain and parabolic on the line which carries the initial data. A maximum principle for a suitable difference equation yields an approximate solution which converges to the solution of the differential equation as the mesh size tends to zero. It is found that the conditions under which the differential equation has the maximum property, as found by Weinberger and Protter, imply that the difference equation has the property, except near the parabolic line. An existence theorem for the solution to the boundary value problem for an equation which is hyperbolic in the interior of a domain and parabolic on a part of the curve carrying the boundary values is proved. 9 refs. See also Ref. 890.

892 **An existence theorem for the equation** $u_{xyz}=f$. J. Conlan, Naval Ordnance Lab., White Oak, Maryland, *PB 171349,* 12 July 1960, 24 p. This report proves an existence theorem for a boundary value problem for the partial differential equation $u_{xyz}=f(x, y, z, u, u_x, u_y, u_z, u_{xy}, u_{xz}, u_{yz})$. The method of proof is such as to lead directly to a simple scheme for the numerical solution of such a problem. 4 refs.

893 **Iterations with errors.** P. Frank, Syracuse University, *PB 152736,* August 1960, 17 p. Let M be a complete metric space and T a transformation of M into itself. There are seven sections: (1) M a complete metric space, no errors. A statement of the contracting mapping theorem; (2) M a complete metric space, bounded errors. Bounds for the accumulated error; (3) M the real numbers, errors random. Existence of a limiting distribution; (4) M a Banach space, errors random. Existence of a limiting distribution; (5) Markov processes and integral equations; (6) M a Banach space, T a linear transformation. Characteristic functions (7) M the real numbers, errors bounded. Bounds on the asymptotoic bias and mean square error. 5 refs.

894 **A method for the simultaneous approximation of eigenvalues and eigenvectors of a real symmetric matrix.** P. C. Patton, Kansas University, *PB 152894,* 74 p. This report describes the results of many numerical experiments with an IBM 650 on a new method for approximating the eigenvalues and eigenvectors of a real symmetric matrix. Although the numerical method is general in nature and could be applied to non-symmetric or complex matrices, the error analysis is valid only for the real symmetric case. The numerical experiments were performed only on sixth and eighth order matrices due to limitations imposed by the small size and slow speed of the computer. The determination of the minimum conditions under which the method will produce correct answers is considered. 11 refs.

895 **Monte Carlo estimates of excursion probabilities of a Gaussian process.** M. B. Freeman, University of California, *PB 148500,* 30 March 1960, 32 p. The probability that a certain Gaussian random process is greater than b throughout a time interval of length t seconds is estimated from observations of a high speed numerical model. The process is characteristic of a simple harmonic oscillator in Brownian motion. 20 refs.

896 **The solution of the characteristic and the Cauchy boundary value problems for the Bianchi partial differential equation in n independent variables by a generalization of Riemann's method.** H. M. Sternberg and J. B. Diaz, Naval Ordnance Lab., White Oak, Maryland, *PB 171351,* 27 July 1960, 192 p. This report deals with a generalisation of a well known method, due to Riemann, for the solution of hyperbolic differential equations. A large class of partial differential equations, containing three and more independent variables can be treated by the techniques developed. 14 refs.

897 **Upper and lower bounds for quadratic integrals, and at a point, for solutions of linear boundary value problems.** J. B. Diaz, University of Maryland, *PB 149729,* June 1959, 53 p. An introduction is presented to several methods for obtaining reliable, precise, numerically computable upper and lower bounds for a large class of problems of the general nature of those mentioned in the title. For definiteness, only certain specific boundary value problems are considered in detail, although the same procedures can easily be seen to be applicable in more general situations. 41 refs.

TECHNIQUES

898 **Computer program abstracts.** *Behavioral Science,* **6,** Jan. 1961, 97-98. Brief descriptions (with sources of more detailed descriptions and/or complete programs) of the following programs:

a. **Multiple scalogram analysis for MISTIC, ILLIAC, SILLIAC, and CYCLONE,** J. C. Lingoes, p. 97. Routine which resolves a binary measurement matrix into a number of submatrices, each of which fulfils Guttman's criteria for unidimensional scales.

b. **An IBM 650 program for factor estimation.** F. J. King, p. 97-98. Given a rotated factor matrix and a non-symmetric matrix of correlations between the tests in the factor matrix and a set of "new" tests not in the factor matrix, this program estimates the loadings of the "new" tests on the existing factors.

c. **An IBM 650 program for transformation analysis.** F. J. King, p. 98. Given two orthogonally rotated factor matrices with common tests, this program computes a correlation matrix between the two sets of factors according to the method of Ahmavaara and Kaiser.

d. **A Bendix G-15θ program for evaluation of the Repertory Test.** H. F. Hess and C. R. Baer, p. 98. This program facilitates evaluation of Kelly's Repertory Test, a psychological test used in both clinical and research applications.

899 **On constructing group codes.** R. B. Banerji, *Information & Control,* **4,** March 1961. 1-14. The problem of constructing systematic error correcting codes may be stated as follows: "Construct a group code such that each word representing an error pattern to be corrected lies in a separate coset." This paper describes a computational method which will generate such codes of any given word length correcting any arbitrarily chosen set of error patterns. Some codes generated by an LGP-30 are described. These codes include double-error and triple-error correcting codes and codes correcting all burst type errors up to 3 digits wide. The relation of the method to other code construction methods is discussed and the generated codes are compared with codes generated by other methods. Some brief remarks on the LGP-30 programs are included. 9 refs.

900 **Error accumulation in digital computations.** V. A. Brik, *Automn. & Remote Control* (Automatika i Telemekhanika in English), **21,** May 1960, 412-415. This paper describes a method of estimating the errors of cyclic computational processes, in which the successively accumulated elementary errors can be considered as independent random variables with an approximately normal distribution density. 7 refs.

901 **A note on error detection codes for asymmetric channels.** J. M. Berger, *Information & Control,* **4,** March 1961, 68-73. This paper describes some new codes which are separable and which also detect all possible errors in a completely asymmetric channel. Some results are given of comparisons between one simple form of the code in which the check bits correspond to the sum of ones in the information bits and the four out of eight code. The new code is found to compare favourably in error detection capability in several cases. Some more complex codes of this type are indicated.

902 **An aid to printed circuit layouts using the IBM-704 computer.** S. D. Stearns and R. A. O'Connell, Sandia Corp., *SCTM-201-60(24),* June 1960, 12 p.

903 **IBM program for fitting data to simple exponential curves of the form** $y=ab^x$. T. B. Patterson, Goodyear Atomic Corp., *GAT-DM-788,* Nov. 1959, 4 p.

904 **An IBM Type 650 program for computing correlation coefficients between paired variables.** L. Muhlick, P. Shanker and A. Dvorak, Washington University, Seattle, *PB 148609,* March 1960, 11 p. 3 refs.

905 **IBM-704 Gaussian-integration routines.** M. P. Lietzke, Oak Ridge National Laboratory, *CF-60-3-48,* March 1960, 12 p.

906 **A note on significance of sums in floating-point arithmetic.** I. N. Rabinowitz, Princeton University, *NYO-2389,* Nov. 1958, 3 p.

907 **Polfit, A 704 program for polynomial least squares fitting.** M. H. Lietzke and M. P. Lietzke, Oak Ridge National Laboratory, *CF-60-3-129,* May 1960, 16 p.

908 **A program for testing sequences of random numbers.** L. Kleinrock, M.I.T., *PB 152934,* 25 Oct. 1960, 27 p. This report describes a program written for the TX-2 computer, which is capable of testing the randomness of sequences of numbers. A sequence of numbers is defined as random if the numbers in the sequence are identically distributed independent random variables. The program performs a series of tests on a sequence and displays the results of the tests on a console oscilloscope. A description of each test is given along with instructions on how to use the program. A set of appendices present a portion of the theory applicable to these tests. 2 refs.

909 **The satellite code: A numerical satellite integration progam for the IBM 704.** V. S. Smith et al., University of California, *UCRL-5462,* June 1959, 46 p.

910 **Technical progress report. Part I High-speed computer program. Part II. Mathematical methods. Part III. Illiac use and operation. Part IV. IBM 650 use and operation. Part V. General laboratory information.** Digital Computer Laboratory, University of Illinois, *AECU-4531,* July 1959, 22 p.

911 **Technical progress report. Part I. High-speed computer program. Part II. Mathematical methods. Part III. Illiac use and operation. Part IV. IBM 650 use and operation. Part V. General laboratory information.** Digital Computer Laboratory, University of Illinois, *AECU-4532,* August 1959, 36 p.

912 **Technical progress report. Part I. High-speed computer program. Part II. Circuit research program. Part III. Mathematical methods. Part IV. Switching circuit theory. Part V. Illiac use and operation. Part VI. IBM 650 use and operation. Part VII. General laboratory information.** Digital Computer Laboratory, University of Illinois, *TID-5972,* Nov. 1959, 40 p.

913 **Technical progress report. Part I. High-speed computer program. Part II. Circuit research program. Part III. Mathematical methods. Part IV. Illiac use and operation. Part V. IBM 650 use and operation. Part VI. General laboratory information.** Digital Computer Laboratory, University of Illinois, *TID-5973,* Dec. 1959, 39 p.

914 **Technical progress report. Part I. High-speed computer program. Part II. Circuit research program. Part III. Mathematical methods. Part IV. Illiac use and operation. Part V. IBM 650 use and operation. Part VI. General laboratory information.** Digital Computer Laboratory, University of Illinois, *TID-5974,* Jan. 1960, 43 p.

915 **Technical progress report. Part I. High-speed computer program. Part II. Circuit research program. Part III. Mathematical methods. Part IV. Illiac use and operation. Part V. IBM 650 use and operation. Part VI. General laboratory information.** Digital Computer Laboratory, University of Illinois, *TID-5978,* Feb. 1960, 36 p.

See also:—
Mathematics, Ref. 888,894.

ACCESSORIES

916 **Analog-to-digital converter.** R. L. Taylor, *IBM Technical Disclosure Bull.,* **3,** March 1961, 128-129. Description of an analogue-to-digital converter in which, to maintain a linear relationship between the input voltage and the digital value derived by a counter, a reversible counter is employed to compensate for any frequency drifts in the two oscillators of the converter.

917 **Analog-to-digital converter.** D. F. Chargois and P. R. Low, *IBM Technical Disclosure Bull.,* **3,** March 1961, 130-131. Description of an analogue-to-digital converter in which a group of Esaki diodes, in series between a reference voltage ramp generator and an analogue voltage input, provides a series of transition outputs which are counted to provide a digital equivalent of the analogue input.

918 **Analog-to-digital converter.** E. F. Yhap, *IBM Technical Disclosure Bull.,* **3,** March 1961, 132-133. Description of a multistage circuit, each stage having a pair of complementary transistors, for converting an analogue voltage or current into a digital signal. The circuit can also be implemented using Shockley four-layer diodes or Rutz commutating transistors.

919 **Closed cycle helium refrigeration.** H. O. McMahon and W. E. Gifford. *Symposium on Superconductive Techniques for Computing Systems,* 1960, 39-55. It is suggested that the practicability and range of applications of superconducive circuits is likely to be determined by the ease and reliability of maintaining the required low temperature, and it is pointed out that, in practice, the problem reduces to that of the feasibility of constructing a mechanical closed-cycle helium refrigerator of sufficient reliability. A description is given of a closed-cycle helium refrigerator which essentially eliminates cold moving parts. This is based on a new engine-expansion system which utilises reciprocating flow through a thermal regenerator instead of counterflow heat exchangers, thereby permitting valves to be operated to room temperatures. 5 refs.

920 **Communication with broad-band microwave oscillator.** D. H. Rumble, *IBM Technical Disclosure Bull,* **3,** March 1961, 55-56. Description of a data transmission system employing a Carcinotron backward wave oscillator.

921 **Disk file sequential access method.** R. J. Sippel, *IBM Technical Disclosure Bull.,* **3,** March 1961, 38-39. Description of a method for reducing the access time to data on a magnetic disc storage device. The method is applicable where data is to be either read in or out sequentially but not continuously. The outermost track of the disc is used for buffer storage and has several read-write heads, each of the other tracks having only one head.

922 **Gray code to true binary code converter.** T. J. Hennessey, *IBM Technical Disclosure Bull.,* **3,** March 1961, 49. Description of a circuit which converts Gray or reflected binary code data to true binary form.

923 **Helical magnetic drum memory.** H. B. Baskin and G. C. Driscoll, *IBM Technical Disclosure Bull.,* **3,** March 1961, 33. Brief description of a memory which is valuable in systems in which information received in serial form is compared for recognition of similarities with blocks of known standard data patterns. Serial data is written in a track at one end of a drum, it is then read and immediately written in the next track and so on along the drum. Data in all tracks is available through parallel read heads.

924 **Magnetic drum head adjuster.** A. B. Carroll, *IBM Technical Disclosure Bull.,* **3,** March 1961, 16-17. Brief description of a tool for making minute adjustments of a head along a track of a magnetic drum.

925 **Magnetic tape cleaner.** P. J. Badum, *IBM Technical Disclosure Bull.,* **3,** March 1961, 14. Brief description of an arrangement to clean a magnetic tape before it reaches a writing or reading head, in which the tape is passed over a sharp edge to remove loose foreign particles which accumulate on the tape.

926 **A numerical-to-electrical converter.** A. K. Zavolokin, *Automn. & Remote Control* (Automatika i Telemekhanika in English) **21,** Feb. 1960, 179-182. This paper describes and analyses the operation of a digital-to-analogue converter. In each cycle, a counter develops two successive signals whose durations are such that the time for the entire cycle remains invariant while the duration of one of the signals is proportional to the digital input. This signal is used for modulating a stablised direct voltage or current which, after smoothing, provides the analogue output.

927 **On one method of constructing analog-to-digital transformers.** A. K. Zavolokin and G. I. Kurakhtanov, *Automn. & Remote Control* (Automatika i Telemekhanika in English), **21,** June 1960, 635-638. This paper suggests a method of analogue-to-digital conversion based on a preliminary conversion of the analogue voltage to proportionate time intervals by integration. A block schematic diagram of a converter is presented and its operation is analysed.

928 **Pneumatic control of magnetic recorder gap.** D. E. Rutter, *IBM Technical Disclosure Bull.,* **3,** March 1961, 15. Brief description of a device which maintains the separation of a head from a magnetic drum constant by use of air pressure which varies with variations in the surface of the drum.

929 **Pulse width modulator-multiplexor.** D. H. Rumble, *IBM Technical Disclosure Bull.*, **3,** March 1961, 92-93. Description of a microwave transmission circuit based on dual reactance switching and pulse width modulation techniques, which accommodates a large number of data channels and gives good linearity of signal.

930 **Readout sequencing system.** C. A. Zito, *IBM Technical Disclosure Bull.*, **3,** March 1961, 61-62. Description of a system for providing a particular readout sequence for status registers in readout circuits. Each register has triggers which store data representing, for example, the status of a tape read-write unit.

931 **Output format considerations for digital automatic data recording.** E. C. Dowling, Sandia Corp., *SCTM-314-59(15),* Feb. 1960, 55 p.

932 **A semiconductor binary coordinate converter.** M. F. Williams, A. F. Thornhill and W. A. Richards, Naval Research Lab., Washington D.C., *PB 149297,* 16 Nov. 1960, 15 p. The characteristics of a semi-conductor binary digital coordinate converter have been investigated. This equipment converts 18-bit polar coordinate data to 20-bit rectangular coordinate data in three milliseconds. The equations used are: $X=\rho \sin \theta$ and $Y=\rho \cos \theta$. Sin θ and cos θ are obtained by the use of a rectangular diode matrix and diode trigonometric function tables; X and Y are obtained by summing partial products in a parallel accumulator type multiplier. 5 refs.

933 **Transword: a portable word generator for use in measurement of bit error distribution.** W. G. Schimdt, M.I.T., *PB 152721,* 19 Oct. 1960, 9 p. The reliability of any digital data communications system is a function, in part, of the bit error rate of the system; the error distribution is usually obtained by a comparison technique in which a word generator is used. This report describes a transistorised word generator designed and constructed to replace the electron tube models with small, highly reliable transistorised units for facilitating the field measurement of error distributions. 2 refs.

934 **Magnetic recording of data.** Automatic Telephone & Electric Co., Ltd., *B.P. 862105,* 1 March 1961. This patent concerns a signal translating circuit for receiving binary signals and writing on a moving magnetic medium in the form of phase-modulated signals.

935 **Magnetic sheet storage system.** G. Dirks, *B.P. 862122,* 1 March 1961. A data storage system comprises magnetic sheets supported in a stack, the sheets being selected for reading or writing by feeding them one at a time to means for sensing identification areas on the sheets.

936 **Data recording system.** Elliott Brothers (London) Ltd., *B.P. 862364,* 8 March 1961. Data is recorded on an elongated member as spatially arranged, localised variations of its magnetic or electric condition; the data is reproduced in the form of mechanical waves in the member by changing the intensity of an electric or magnetic field in the member.

937 **Magnetic tape recording apparatus.** Electric & Musical Industries Ltd., *B.P. 862625,* 15 March 1961. In magnetic tape apparatus designed for data recording, an adjustably mounted backing surface is provided to maintain the tape at a required spacing from the heads.

938 **Magnetic recording of data.** Int. Business Machines Corp., *B.P. 862632,* 15 March 1961. A magnetic head for data recording is normally supplied with direct current which is interrupted when both inputs of an AND circuit are energised.

939 **Head positioning system for a magnetic drum.** Nat. Research Development Corp., *B.P. 863015,* 15 March 1961. A positioning system for the heads of a magnetic drum, comprises members on a common axis, relative movement between each pair of adjacent members being effected by independent pneumatic control means.

940 **Circulating store circuitry.** Electric & Musical Industries Ltd., *B.P. 863634 & 863635,* 22 March 1961. These two patents are concerned with circuit arrangements for recording in or reproducing from a circulating store used, for example, for buffer storage.

941 **Magnetic disc recording.** Siemens & Halske A.-G., *G.P. 1098736 & 1098746,* 2 Feb. 1961. These two patents are concerned with magnetic data storage apparatus in which magnetic heads are embedded in and are flush with the surface of a plane plate underneath a rotating disc carrying a magnetic layer on its underside.

942 **Analogue-to-digital converter.** Int. Telephone & Telegraph Corp., *U.S.P. 2958861,* 1 Nov. 1960. A device for translating shaft rotations into coded electrical pulses, employs code wheels and, in order to avoid false readouts, lead and lag brushes are selected by a switching matrix.

943 **Magnetic head.** Int. Business Machines Corp., *U.S.P. 2961645,* 22 Nov. 1960. This patent is concerned with a wide-write, narrow-read magnetic transducer of improved design.

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944 **Analog multiplication and division circuit.** W. E. Dickinson, *IBM Technical Disclosure Bull.*, **3,** March 1961, 136-137. Circuits for analogue multiplication and division are described, employing a lamp controlled by an amplifier and shining on two photoresistors.

945 **An analog solution for the static London equations of superconductivity.** N. H. Meyers, *Symposium on Superconductice Techniques for Computing Systems,* 1960, 331-352. This paper presents and discusses an analogue method of obtaining solutions of the static London equations in complicated geometries. The method makes use of the similarity in form of the static London equations and the skin effect equations of normal conduction under exponentially-growing steady state conditions. Conveniently scaled copper models of superconducting geometries of interest can be constructed and excited from a growing-exponential function generator. Field distributions measured in the space around the normal conductors of the model correspond with the desired distributions in the analogous superconductor geometry. The method is particularly useful in studying thin films which are appreciably penetrated by magnetic fields. Results from a copper model of a long rectangular superconducting strip, 1830 penetration depths wide and 3.81 penetration depths thick, are presented. Results from a model of a singly-shielded, crossed film planar cryotron with a 2 to 1 gate to control width ratio are also given. 5 refs.

946 **Analysis of a crossed film cryotron shift register.** H. H. Edwards, V. L. Newhouse and J. W. Bremer, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 230-237. After briefly describing the physical structure of a shift register employing a cascaded arrangement of crossed film cryotron storage cells, this paper describes two modes of operation of the shift register, one utilising three stages per bit and requiring three advance and three reset current sources and the other having four stages per bit but needing only two advance and two reset current sources. The operation criteria are then analysed and, finally, the experimental output waveforms and speed of operation are presented. 2 refs.

947 **An approach to the experimental study of persistent-current devices.** C. R. Vail, M. S. P. Lucas, H. A. Owen and W. C. Stewart, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 56-74. As part of an investigation of superconductive circuitry, with particular reference to the persistatron, there is being conducted an experimental study of the effects of composition and geometry on the property of superconductivity in thin film strips. Also under way are an experimental study and a preliminary analysis of the static and transient characteristics of the persistatron. After a brief description of the persistatron (a ring of superconducting material with a pair of terminals arranged to provide two parallel paths of different lengths and hence of different inductance), this paper discusses certain techniques used in the studies. These techniques include: the evaporation of vanadium and tantalum by electron bombardment, and of lead by the boat method; methods of masking, with reference to both metal and printed masks; and a method of testing persistent-current devices directly in a helium storage flask. Flexible pulse generating equipment for testing purposes is described. Some experimental results are presented. 6 refs.

948 **Associative memory.** R. F. Rosin, *IBM Technical Disclosure Bull.*, **3,** March 1961, 120-122. Description of a superconductive associative memory which is also effective to interrogate the memory in response to information stored in the memory. Each storage cell includes four cryotrons and data is stored in the form of a circulating persistent current, the direction of circulation being indicative of "0" or "1".

949 **British research on superconductive switching devices.** P. R. Stuart, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 109-112. This paper which gives a brief account of work at the National Physical Laboratory on the planar cryotron, is substantially identical to the author's article "Superconductive switching for computers—2: The planar cryotron", *Auto. Control,* **13,** Sept. 1960, 43-45. *(C.A.,* **4,** Oct. 1960, Ref. 1970).

950 **Characteristics of bulk and thin film superconducting alloys.** A. M. Toxen, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 249-261. In this paper, it is first shown that by alloying (of indium and mercury, for example), materials can be produced whose superconducting transitions are as "ideal" as those of the best elemental specimens, but whose residual resistivities are a thousand-fold larger. The results of a study of thin alloy films using an indium-tin system are then presented. A figure of merit (taken as the ratio of residual resistivity to film critical field) is considerably larger for the alloy films than for pure indium films and seems to increase with increasing film thickness and tin content. 16 refs.

951 **Characteristics of film cryotrons.** M. L. Cohen and J. L. Miles, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 198-212. In this paper three figures of merit or design parameters are derived which are useful in circuit design and provide a basis for comparison and selection of cryotron gate materials and thicknesses to suit particular circuit applications. From certain measurements on cryotrons, basic general parameters may be computed which relate to critical gate current, critical controlling current, area resistivity and current gain. The three figures of merit are defined as certain ratios and combinations of the basic parameters. 2 refs.

952 **Continuous sheet superconductive memory.** L. L. Burns, G. W. Leck, G. A. Alphonse and R. W. Katz, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 167-185. This paper describes a type of persistent current superconducting memory cell having two holes. In operation, as the current in a drive pulse increases a field is reached that causes the centre portion of the cell to become normal and flux lines then link a sense line causing an output signal; as the drive current decays towards zero a persistent current is set up circulating the two holes and a trapped flux exists. It is shown that a development of this cell has higher speed and is easier to make, in which a continuous superconductive memory plane stores information as a persistent current at the boundary between the normal and superconducting phases, the normal phase (which replaces the holes) being enclosed by the superconducting phase. In the equilibrium position the trapped flux is sufficient to keep the enclosed portion in the normal state. 4 refs.

953 **Counter circuit.** W. B. Riley, *IBM Technical Disclosure Bull.*, **3,** March 1961, 51-52. Description of a counter which uses n trigger circuits to obtain 2^n sequential outputs on separate leads.

954 **Crosstalk elimination.** L. W. Atwood, *IBM Technical Disclosure Bull.*, **3,** March 1961, 105-106. In high speed data storage matrices a serious problem is presented by crosstalk of inductive coupling between parallel coordinate drive conductors. An arrangement is described which eliminates this coupling by providing mutual cancellation of induced signals in adjacent conductors.

955 **Current induced switching of superconductive thin films.** F. W. Schmidlin, A. J. Learn, E. C. Crittenden and J. N. Cooper, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 130-152. This paper appears to be the same as the authors' report *PB 150042* (*C.A.,* **5,** Feb. 1961, Ref. 329). 4 refs.

956 **Edge effects in superconducting films.** R. B. DeLano, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 319-330. This paper discusses the effect that edges of typical evaporated tin films have on their magnetic and temperature transitions, and the importance of these effects on thin film cryotron characteristics. Practical methods for eliminating the edge effect are mentioned. 8 refs.

957 **Effect of defects on the superconducting properties of tantalum.** D. P. Seraphim, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 239-310. This paper describes and presents the results of experiments to determine the effect of lattice defects on the superconducting characteristics of bulk tantalum. It is shown that interstitial impurities, inhomogeneous elastic strain and plastic deformation have significant effects on the characteristics of the resistance transition in tantalum. 22 refs.

958 **Effect of residual gases on superconducting film characteristics.** H. L. Caswell, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 262-288. This paper describes and presents the results of a study of the effect on superconductive film characteristics of residual gases in vacuum systems for vapour deposition of films. To evaluate the significance of each type of gas very high purity films were deposited and their characteristics compared with those of films evaporated in a high residual pressure of a particular gas. It is concluded that in order to obtain high purity tin films with desirable superconducting characteristics it is not necessary to reduce the total pressure in a vacuum evaporator to a very low value, but only to reduce the partial pressures of various critical gases. Oxygen is the most important, followed by water vapour and carbon dioxide. Clean substrates, referably baked in vacuum to reduce adsorbed water vapour, must be employed. Gross hydrocarbon contamination must be eliminated and the hydrocarbon partial pressures maintained at reasonably low values. 18 refs.

959 **Esaki diode-transistor shift register.** A. J. Gruodis, *IBM Technical Disclosure Bull.*, **3,** March 1961, 95-96. Description of a shift register employing transistors and a tunnel diode in each stage, which operates at speeds of the order of 5 Mc/s.

960 **Formation of thin polymer films by electron bombardment.** R. W. Christy, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 186-197. It has been observed that surfaces which are struck by an electron beam become covered with a thin insulating film, due to organic vapour in the vacuum system. The mechanism of the film formation is the free radical polymerisation of the organic molecules adsorbed on the surface, the molecules being cross-linked under the action of the electrons to form a solid polymer film. It has been suggested that this effect could be usefully exploited when a thin insulating film is required, particularly in the fabrication of superconducting thin film computer circuits. In forming an etch resist or insulating layer, very small scale circuit configurations can be produced, because of the great demagnification obtainable with an electron image. Organic silicon polymers are of particular interest because of their excellent dielectric properties, and this paper concerns a detailed study of the factors affecting the film growth rate using a silicone oil as raw material. From the theory and experiments described, it is concluded that the rate of formation of a solid polymer film by electron bombardment in the presence of a silicone oil vapour depends on the electron current density, the rate of impingement of oil molecules on the substrate, and the temperature of the substrate. Films were produced with excellent electrical insulating properties and the thinner films showed interesting non-ohmic behaviour. 16 refs.

961 **High frequency behavior of very thin superconducting films and changes in critical temperature produced by electrostatic charging.** R. E. Glover, *Symposium on Superconductive Techniques for Computing Systems,* 1960. 153-159. This paper first describes some work which shows that the difference in transmission of a thin film in the normal and superconductive states could be used to modulate the flow of high frequency radiation, the modulation being particularly effective in the centimetre mircrowave region. The second part of the paper discusses the results of measurements of the effect of electrostatic charging on the superconducting transition temperature of tin films; the transition temperature is increased by negative charging and decreased by positive charging. 9 refs.

962 **Initial studies of the preparation and properties of vanadium thin films.** J. D. Blades, J. Gerber and C. T. Thompson, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 121-129. Results are presented of some experimental investigations of film texture and residual resistance (the ratio of film resistance at liquid helium temperature to that at room temperature) of thin vanadium films. 7 refs.

963 **Load stabilized Esaki diode memory.** W. W. Lawrence and H. P. Wolff, *IBM Technical Disclosure Bull.*, **3,** March 1961, 97-98. Description of a data storage matrix of tunnel diodes (four in each storage cell) which presents a constant load to word and bit drivers so as to simplify the design of such drivers.

964 **Memory adder.** C. Ailes, *IBM Technical Disclosure Bull.*, **3,** March 1961, 123-125. A memory composed of superconducting flip-flop circuits, incorporates cryotron circuitry for adding stored words.

965 **Multipath memory device.** L. A. Russell, *IBM Technical Disclosure Bull.*, **3,** March 1961, 103-104. Description of a magnetic element, for use in two- or three-dimensional matrices, having three apertures and employing flux steering to store binary data.

966 **A new type of bistable element involving thermal propagation of a normal region in a thin superconducting film.** R. F. Broom and E. H. Rhoderick, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 113-120. The matters dealt with in this paper are substantially the same as those in the authors' more detailed paper "Thermal propagation of a normal region in a thin superconducting film and its application to a new type of bistable element", *Brit. J. Appld. Physics,* **11,** July 1960, 292-296 (*C.A.*, **4,** Sept. 1960, Ref. 1744). 6 refs.

967 **Octal counter.** D. J. Hinkein and W. W. Martin, *IBM Technical Disclosure Bull.*, **3,** March 1961, 72-73. Description of a binary counter divided into octal groups of stages for reducing the resolution time due to ripple carries between stages.

968 **One-shot circuit.** F. J. Soychak, *IBM Technical Disclosure Bull.*, **3,** March 1961, 87-88. Description of a one-shot circuit employing two transistors.

969 **Operation and analysis of planar cryotrons and simple cryotron circuits.** G. B. Rosenberger, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 374-395. It is possible with simple cryogenic loops containing two drive cryotrons and a number of sensing cryotrons to study both the operating characteristics of the individual cryotrons as well as the static and dynamic switching characteristics of the loop. Some of the characteristics of the individual cryotrons and the reproducibility of cryotrons with these characteristics are discussed. The speed with which current can be transferred from one branch of the loop to another has been measured experimentally and calculated theoretically from the dimensions and various measured parameters of the loop and its cryotrons. Good agreement is found between theory and experiment. 2 refs.

970 **Outline of recent developments.** B. Serin, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 1-4. Brief review of recent experimental results in the physics of superconductivity. 13 refs.

971 **Physics and characteristics of the crossed film cryotron—a review.** V. L. Newhouse, J. W. Bremer and H. H. Edwards, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 14-37. This paper applies recently published results on the physical properties of thin superconductive films to an analysis of the crossed film cryotron. The work described was done mainly at the General Electric Research Laboratory. After a brief description of the principles of the crossed film cryotron, methods for studying and predicting the low frequency properties of the crossed film cryotron which depend on Joule heating are described. The current gain in the region where Joule heating is unimportant is then analysed. An analogue storage circuit is described which has been used to measure the time constant of one crossed film cryotron driving another. 16 refs.

972 **Properties of thin film cryotrons.** A. E. Brennemann, *Symposing on Superconductive Techniques for Computing Systems,* 1960, 366-373. A simple formula derived on the basis of the London theory is used to describe the variations of cryotron current amplification with temperature and effective penetration depth. Experimental results are presented which are 0.5 to 0.6 of the predicted values. The deviation is attributed to a lower critical current than that expected from the simple formula. It is believed that minute defects in the film geometry and unknowns in the current distribution could easily account for the discrepancy between the experimental and expected results. 5 refs.

973 **Research on superconductive devices in Sweden.** R. E. Jacobsson, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 160-161. Work on superconductive devices at the Royal Institute of Technology, Stockholm and the Chalmers University of Technology, Goteborg is outlined.

974 **Restraint domain nucleation in thin magnetic films.** S. Methfessel and S. Middelhoek, *IBM Technical Disclosure Bull.*, **3,** March 1961, 102. A problem associated with a magnetic thin film storage element is stray field coupling emanating from its edges. This causes nucleation and the element exhibits an unpredictable switching behaviour. A construction to avoid this effect is briefly described.

975 **Semi-permanent memory.** G. D. Bruce, *IBM Technical Disclosure Bull.*, **3,** March 1961, 18-19. Description of a memory for semi-permanent storage of binary data by means of magnetic cores and printed circuit cards or sheets. The apertured cards are stacked on the legs of the U-shaped magnetic cores. Each core represents a separate multi-bit word storage location. Two cards bear row and column selection windings respectively while other cards carry sense windings and represent bit storage planes. See also Ref. 976.

976 **Associative semi-permanent memory.** G. D. Bruce, *IBM Technical Disclosure Bull.*, **3,** March 1961, 20-21. Description of a modification of the memory of Ref. 975 in which the bit plane cards are designed for operation in an associative or tag-addressed mode.

977 **Some British research on superconductive switching devices.** D. H. Parkinson, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 104-108. Account of recent work at the Royal Radar Establishment on Crowe cells and their use in computers. This paper is essentially the same as the author's article "Superconductive switching for computers—1: Crowe cell progress report", *Auto. Control,* **13,** Sept. 1960, 40-43 (*C.A.*, **4,** Oct. 1960, Ref. 1969), but is slightly more detailed and omits the diagrams which accompanied the article. 7 refs.

978 **Superconducting films less than 100 Angstrom units thick.** D. Abraham, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 162-166. This paper describes research designed to determine whether superconductive elements might provide the basis for ultra high speed computers. It was found that films of tin having a thickness of less than 20 Å and a normal resistance of more than about 200 ohms/square could not be deposited reproducibly or preserved for any considerable length of time. However, just within this reliability threshold, films have a resistivity which suggest that they would naturally lends themselves for use as non-reflective elements in high frequency transmission lines when in the normal state. The results are discussed of experiments on the critical current dependence on film configuration of very thin films and on the behaviour of the films in response to electrical signals containing frequency components well into the microwave region. It is concluded that there is a possibility of producing relatively inexpensive, broadband, cryogenic, microwave devices operating in the K-band frequency range and that if this possibility materialises, exceedingly fast microwave computers of reasonable bulk may become economically feasible. 2 refs.

979 **Thermal and electrodynamic aspects of the superconductive transition process.** W. H. Cherry and J. I. Gittleman, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 75-103. This paper attempts to increase the theoretical understanding of the dynamic processes occurring in the transitions between normal and superconductive states. In the case of the superconductive-to-normal transition induced in a thin wire or strip of film by the flow of a sufficient electric current, one of the chief dynamic aspects of the process is discussed on the basis of a proper accounting of all heat generation and flow, particularly of the Joulean heat generated in an already-normal region. The derivations are outlined of the formulae describing the velocity of propagation of the transition and of the relations between current, bath temperature and the quenching characteristics of the material. The approximations necessary are indicated. In many other cases, such as expulsion of or quenching by an external magnetic field, or in certain extreme conditions of current quenching and recovery, the chief aspects of the process are electrodynamic. While the Londons' equations and boundary conditions give a complete characterisation of the electrodynamic properties of the superconductor, they do not apply to the transition process itself. Some considerations are given for an appropriate generalisation of these equations, and those of more recent theories, to the transition, and a few, simple, heuristic models are used to suggest specific equations. 16 refs.

980 **Thin film cryotron catalog memory.** A. E. Slade and C. R. Smallman, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 213-229. This paper discusses the use of low gain, thin film cryotrons in a catalogue memory. A catalogue memory is essentially a comparator where all the words in a catalogue can be compared simultaneously with any other word, the output being a yes or no answer to the comparison. The catalogue memory described makes use of a persistent current memory cell consisting of an enable cryotron used in the write cycle, and an output cryotron used in the read cycle. 11 refs.

981 **Thin film cryotron time constants.** W. B. Ittner, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 239-248. If, as seems likely, the superconducting penetration depth of a thin film is a function of both the film thickness and the material purity, the cryotron gain characteristics of a thin film cryotron will depend on film thickness and speciment purity in a manner which is not immediately evident from the London theory. This paper shows in a qualitative manner how the general features of the non-local theory serve to determine the L/R time constant of a simple cryogenic loop. 3 refs.

982 **Thin film electronic circuits.** R. A. Jones and E. Kulak, *IBM Technical Disclosure Bull.,* **3,** March 1961, 101. Brief description of the fabrication of a thin film electronic circuit package in which a layer of silicon monoxide is first deposited on the ceramic substrate. This layer provides a smooth surface and reduces pin hole failures in the ground and voltage planes which are subsequently deposited.

983 **Thin-film memories.** E. E. Bittman, *Instr. & Control Systems,* **34,** March 1961, 451-454. The principles and operating characteristics of thin film memories employing planar 80-20 Ni-Fe films less than 5000 Å thick are outlined. Operation of linear select, coincident current and non-destructive readout memories is described. Techniques for thin film fabrication are discussed. 6 refs.

984 **A universal function generator based on the principle of quadratic approximations.** A. A. Maslov and Y. G. Purlov, *Automn. & Remote Control* (Automatika i Telemekhanika in English), **21,** Feb. 1960, 164-168. Methods are present for quadratic approximations for functions given either analytically or graphically. Simple formulae and relationships are derived for finding the rule for argument partitioning. A circuit employing vacuum tube diodes for a universal function generator is described, the generator being suitable for use with an EMU-8 analogue computer. 11 refs.

985 **Use of superconducting transmission line for measuring penetration depth.** D. R. Young, J. C. Swihart, S. Tansal and N. H. Meyers, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 311-318. This paper describes some experiments on the measurement of penetration depth using a transmission line constructed with superconducting films for conductors and an insulation layer comparable in thickness to the superconducting penetration depth. The propagation constants of such a transmission line are markedly influenced by the superconducting penetration effect.

986 **The use of superconductive devices in research at low temperatures.** I. M. Templeton, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 6-13. This paper is concerned with the use of superconductive devices in the measurement of e.m.f.'s of the order of 10^{-8} which are encountered in research at low temperature. Descriptions are given of a superconductive reversing switch, a superconductive modulator or chopper, a superconductive bridge amplifier and a superconductive thermal switch. 7 refs.

987 **Word-oriented memory.** W. T. Siegle and J. G. Wamsley, *IBM Technical Disclosure Bull.,* **3,** March 1961, 107-108. Description of a word-oriented memory system which employs two magnetic cores for each bit storage cell, but does not require bipolar bit or digit currents during the storing cycle.

988 **Word-oriented memory.** G. D. Bruce and W. T. Siegle, *IBM Technical Disclosure Bull.,* **3,** March 1961, 109-110. Description of a word-oriented memory system in which the advantages of two-core-per-bit storage are attained with less than two cores per storage location.

989 **Separate carry storage adders. Report no. 97.** S. Takahashi, University of Illinois, *TID-5739,* March 1960, 13 p.

990 **Switching and memory criteria in transistor flip-flops.** D. K. Lynn and D. O. Pederson, University of California, *PB 147313,* 2 March 1960, 23 p. It is well known that the magnitude and length of the minimum input trigger pulse is closely related to the switching and memory aspects of the flip-flop. A study of the relationships is made in this report. Not all energy or charge storage elements or mechanisms can serve as the flip-flop memory. A memory criterion in terms of a simple physical argument has been established to determine which storage elements provide the necessary memory function. Switching criteria and the minimum amount of memory are determined from an analysis of the initial conditions of the regenerative switching action using piecewise linear analysis techniques. From this information, estimates of maximum repetition frequency are made. Capacitively and inductively coupled flip-flops are used as illustrations, and experimental results with the circuits are presented. 8 refs.

991 **Thin-film circuit functions. W.** N. Carroll, R. G. Counihan et al., Int. Business Machines Corp., *PB 152672,* 1960, 120 p. The selection of the astable multivibrator as the sixth circuit to be fabricated, factors affecting layout of thin film circuits, machined masks, inductor fabrications, and the results of several preliminary circuit fabrications are described in this quarterly progress report. Data is presented on thermo-compression bonds. Results are given of studies on the epitaxial deposition of silicon by the silicon-iodine disproportionating reaction in a closed tube. Steps taken to reduce substrate etching during normal deposition are described. The feasibility of codepositing desired impurities with silicon was investigated and experimental results are given for two methods of introducing impurities. A description is given of several experimental methods for the fabrication of multiple layer junctions. The measured characteristics of fabricated diodes are presented. The six final circuits are described with detailed circuits and layout information. Equipment used for fabricating the experimental models is described and the results of the first fabrication runs tabulated. 18 refs.

992 **Decimal counter.** Veb Elektronische Rechenmaschinen Wissenschaftlicher Industriebetrieb - Karl - Mark - Stadt, *B.P. 861913,* 1 March 1961. This patent concerns a decimal counter having four bistable stages each comprising two transistors and in which the second and third stages are each supplied from a succeeding stage with a potential which converts them to monostable operation.

993 **Parallel adder.** Sperry Rand Corp., *B.P. 861926,* 1 March 1961. A parallel adder has in each stage a binary counter which includes two magnetic amplifiers.

994 **Superconductive device.** Int. Business Machines Corp., *B.P. 862178,* 1 March 1961. In a current control device employing a superconductive element, operating speed is increased by providing screening arrangements to reduce the effective inductance of means for producing a magnetic field.

995 **Shift register.** Philips Electrical Industries Ltd., *B.P. 862794,* 15 March 1961. A shift register employs transfluxors whose small apertures are provided with auxiliary windings from which voltages indicating the states of the transfluxors may be derived.

996 **Transistor adder.** Int. Business Machines Corp., *B.P. 863161,* 15 March 1961. In an adder designed for high speed operation, each input is supplied to a transistor current generator. The generators develop different potentials across a common load according to the inputs and transistor circuits each deliver an output in response to a different one of such potentials.

997 **Monostable and bistable circuits.** Int. Business Machines Corp., *B.P. 863621,* 22 March 1961. This patent describes a pulse circuit, monostable or bistable, which employs transistors of the same conductivity type.

998 **Magnetic core circuit.** Associated Electrical Industries Ltd., *B.P. 863654,* 22 March 1961. A data storage circuit employs three magnetic cores arranged for non-destructive readout.

999 **Shift registers and counters.** Kienzle Apparate G.m.b.H., *B.P. 863814,* 29 March 1961. A shift register or counter designed for operation in both directions, employs magnetic cores each with only two windings.

1000 **Semiconductor Switch.** Sylvania Electric Products Inc., *B.P. 863829*, 29 March 1961. A switching device comprises a semiconductor body with specified regions and in which, in response to avalanche breakdown, the direction of a magnetic field produced by electromagnetic means is altered so as to deflect current carriers from one connection to another.

1001 **Ferroelectric data store.** Int. Computers & Tabulators Ltd., *B.P. 864116*, 29 March 1961. In a data store employing ferroelectric elements, non-destructive readout is effected with plane polarised light.

1002 **Ferroelectric data store.** Int. Computers & Tabulators Ltd., *B.P. 864119*, 29 March 1961. A ferroelectric data storage cell is set to a desired value of remanent polarisation by simultaneously applying an electric field and a mechanical stress.

1003 **Magnetic core storage device.** Int. Business Machines Corp., *B.P. 864300*, 29 March 1961. A magnetic core is selectively caused to assume one of two temperatures at which it has different coercivity values.

1004 **Shift register.** Licentia Patent-Verwaltungs-G.m.b.H., *G.P. 1100345*, 23 Feb. 1961. A shift register for binary-decimal values, has associated with the binary positions of each decimal position storage devices controlled by a common shift pulse.

1005 **Multistable magnetic core circuit.** Int. Business Machines Corp., *U.S.P. 2958787*, 1 Nov. 1960. This patent describes a multistable circuit employing magnetic cores, which is suitable for a decimal counter or shift register.

1006 **Multi-cathode glow transfer tube.** Int. Business Machines Corp., *U.S.P. 2958807*, 1 Nov. 1960. Rapid transfer of the glow discharge from one cathode to another in a multi-cathode glow transfer tube is effected with preferential glow transfer obtained by means of a shield or baffle member arranged in proximity to a portion of a cathode.

1007 **Shift register.** Hughes Aircraft Co., *U.S.P. 2958852*, 1 Nov. 1960. A shift register employing magnetic cores, capable of bidirectional operation, is designed so as to avoid the need for diodes.

1008 **Multi-apertured magnetic core.** Burroughs Corp., *U.S.P. 2958854*, 1 Nov. 1960. A magnetic core with at least two additional small circular apertures, is generally circular but has, adjacent each such aperture, arcuate projections with centre of radius at the centre of the adjacent aperture.

1009 **Analogue multiplier.** R. D. Trueblood, *U.S.P. 2959350*, 8 Nov. 1960. This patent describes an analogue multiplier making use of a specified square function generator employing symmetrical nonlinear resistive elements such as "thyrites" or "varistors".

1010 **Gate.** Sperry Rand Corp., *U.S.P. 2959684*, 8 Nov. 1960. Gating and buffer circuits in which diodes are largely replaced by magnetic amplifiers are described.

1011 **Bistable circuit.** Sperry Rand Corp., *U.S.P. 2959685*, 8 Nov. 1960. A bistable circuit or flip-flop is described which employs a magnetic amplifier and a delay line.

1012 **Half adder.** Sperry Rand Corp., *U.S.P. 2959687*, 8 Nov. 1960. A half adder is composed of magnetic cores and transistors.

1013 **Multiple gate cryotron switch.** Arthur D. Little Inc., *U.S.P. 2959688*, 8 Nov. 1960. Several superconductive gate conductors each pass through one coil of each of several pairs of control coils, each conductor passing through a different combination of coils.

1014 **Shift register.** Sperry Rand Corp., *U.S.P. 2959770*, 8 Nov. 1960. A shift register employing complementing magnetic amplifiers connected in cascade.

1015 **Digital multiplier.** Toledo Scale Corp., *U.S.P. 2961160*, 22 Nov. 1960. Pulses equal in a number to a digit of a multiplier are generated and each triggers a pulse generator which is set to produce a number of pulses according to a digit of the multiplicand, which pulses are supplied to a counter.

1016 **Magnetic core package.** Burroughs Corp., *U.S.P. 2961584*, 22 Nov. 1960. A magnetic core package comprises a plug-in board carrying printed conductors interrupted by slots. Each slot receives two printed circuit cards, flexed by a spacer so as to be retained in the slot, carrying a magnetic core.

See also :—
Design, Ref. 864.

ANALOGUE

1017 **The EMU-8 electronic analog computer.** *Automn. & Remote Control* (Automatika i Telemekhanika in English), **21,** March 1960, 301-302. Brief description of the EMU-8 analogue computer, designed for investigation of linear and nonlinear dynamic systems, which is being produced in the U.S.S.R.

DIGITAL

1018 **Spatial digital computer.** Western Electric Co., Inc., *B.P. 862257*, 8 March 1961. A digital computer for spatial problems such as chess playing or pattern recognition, comprises an array of modules, each of which includes storage, logic and arithmetic circuitry and to which individual input data sources are coupled in a pre-assigned relationship, corresponding orders being applied to the different modules.

1019 **Data processing system.** Int. Business Machines Corp., *U.S.P. 2958851*, 1 Nov. 1960. This patent is concerned with a data processing system with arrangements whereby data in an asynchronous storage device (e.g. photoelectrically read film strip record) can be transferred to or compared with data in a synchronous storage device (e.g. magnetic drum). A control voltage is obtained from a pair of ring counters supplied with clock pulses from the two storage devices.

1020 **Data processor.** Int. Business Machines Corp., *U.S.P. 2959351*, 8 Nov. 1960. This patent, consisting of 77 pages of text and 228 sheets of drawings, provides a comprehensive description of a magnetic drum computer with large memory capacity (2,000 ten-bit words), high reliability, ease of operation and high programming capacity while being compact in design and moderate in cost.

PROGRAMMING

1021 **Controlling conditional program branching.** T. G. Leary, *IBM Technical Disclosure Bull.*, **3,** March 1961, 40-43. Description of an arrangement for controlling a conditional branching operation in an IBM 305 RAMAC.

1022 **A critical appraisal of COBOL.** *Computer Bull.*, **4,** March 1961, 141-143. A report of the Working Committee of the British Computer Society Study Group on Advanced Programming. Critical comments are made on various aspects of COBOL and recommendations for its improvement are put forward. It is concluded that "a suitable form of common language has not yet been arrived at. Full compatability between machines has not been attained and it is not possible to judge without further evidence whether COBOL is suitable for common business usage. The language itself contains the elements of several useful concepts. . . . A number of structural defects have been isolated and the group cannot recommend it for general use without some modification. Before any further attempt at a common language is made a thorough and detailed study should be undertaken of users' practical requirements." See also Ref. 1023.

1023 **Cobol.** P. V. Ellis, *Computer Bull.*, **4,** March 1961, 144. Letter referring to the report on COBOL (abstracted in Ref. 1022), and stating that "there will be many, ICT included, who cannot agree with some of the assertions, and certainly cannot agree with the conclusions." COBOL is defended against criticisms in the report and experience of International Computers and Tabulators Limited in implementing the language is mentioned.

1024 **One cycle conditional transfer.** P. M. Gannon, *IBM Technical Disclosure Bull.*, **3,** March 1961, 45-46. A system is described whereby the operation time for a conditional transfer operation is nearly halved by re-entering the loop automatically.

1025 **Survey of modern programming techniques.** R. W. Bemer, *Computer Bull.*, **4,** March 1961, 127-135. This paper reviews new and improved techniques in the programming field; it is concerned with generalised techniques and does not cover specific applications. There are six sections entitled: Elements of languages (mainly concerned with bit representation of characters); Machine-dependent languages (briefly indicates differences in type of machine languages); Machine-independent languages (classified here as either procedure-oriented or problem-oriented, ALGOL and COBOL and other languages are discussed and future possibilities indicated); Analysis languages (brief mention of the possibility of the analysis language for describing the operation of a total system); Processor techniques (consideration of such matters as symbol manipulation, "bootstrapping", list processors, flow optimisation, and compilers and interpreters); Operating systems (possibilities of fully automatic machine-controlled operation are considered).

1026 **GENDARE system: fundamental concepts of logic and structure.** J. B. Williams M.I.T., *PB 152722,* 17 Oct. 1960, 20 p. GENDARE (GENeralised DAta REduction) is a programming system to provide data reduction services easily and cheaply when large volumes of data are to be processed. GENDARE design starts with the observation of logical redundancies in the class of programs devoted to data reduction. On this basis the existence of a general case for this program class is postulated, assumptions made about the form of the inputs, and determining characteristics discussed for the processing to be performed. From this foundation the fundamental elements of GENDARE logic and structure are developed as a natural consequence.

See also :—
Applications: Miscellaneous, Ref. 1070f.

APPLICATIONS

AERONAUTICAL

1027 **Computers for aircraft simulation.** M. E. Connelly, M.I.T., *PB 152885,* 15 Dec. 1959, 115 p. This report is the concluding work on a one-year study of the equations of motion and the computing techniques used in the aerodynamics computer section of operational flight trainers. A review of the characteristics of basic 60 c/s, 400 c/s and d.c. analogue computing techniques is presented with emphasis on the relative applicability of these techniques to the unique requirements of the operational flight trainer problem. It is concluded that 400 c/s techniques would give more than acceptable performance and would offer substantial advantages with respect to cost, size, maintenance and power consumed. Several suggestions are made concerning operational flight trainer acceptance procedures, the matching of the trainer to the actual aircraft and standardisation. 124 refs.

1028 **Development of a computer subroutine for planetary and lunar positions.** H. F. Michielsen and M. A. Krop, Lockheed Aircraft Corp., *PB 171196,* August 1960, 99 p. Ephemerides of the nine major planets and the moon, as obtained from the American Ephemeris and Nautical Almanac, are processed and converted into a format specifically tailored for use in space flight activities. The information is given with respect to an inertial reference system, the Mean Equinox 1950.0, and expressed primarily in rectangular coordinates, although spherical coordinates are also obtained. The ephemerides are heliocentric for the planets and geocentric for the moon. This report is an explanation and substantiation of the computer subroutines developed for use on the IBM 709 or Remington Rand 1103AF computers. 9 refs.

See also :—
Engineering, Electrical, Ref. 1039.

BUSINESS

1029 **Progress towards controlling Post Office telecommunication stores by computer.** H. H. Simmons, *Computer Bull.*, **4,** March 1961, 136-139. The problem of the Post Office Supplies Department in maintaining a proper balance of stocks of some 30,000 telecommunications items is briefly described. The use of a punched card system is outlined and the preparations for an ICT 1201 are then described. Program developments and experience gained after two years of computer operation are discussed. Future plans are briefly indicated.

1030 **Voice answer back system.** W. C. Dersch, *IBM Technical Disclosure Bull.*, **3,** March 1961, 64. Brief description of an automatic stock quotation system employing a digital computer, a queuing device, composing matrices, a digital-to-audio converter including a vocabulary recorded on a gramophone record, broadcast switching circuits and loudspeakers.

See also :—
Miscellaneous, Ref. 1070*b*, 1070*d*.

CHEMICAL

1031 **Adaptice automatic control system for obtaining aluminium by the electrolytic process using a computing device.** E. P. Sarkisyan, M. M. Agababyan and P. S. Saakyan, *Automn. & Remote Control* (Automatika i Telemekhanika in English), **21,** June 1960, 563-567. This paper describes an adaptive automatic control system, constructed with digital computer elements, for the electrolytic process for obtaining aluminium. The control system causes the process to minimise a variable component of the cost. The search for the optimal mode is carried out in terms of one variable, namely the position of the anode.

1032 **Use of electronic computers for Bessemer process automation.** V. M. Glushkov, L. N. Dashevskii and A. I. Nikitin, *Automn. & Remote Control* (Automatika i Telemekhanika in English), **21,** June 1960, 617-621. Description of the first stage of a programme to develop a digital computer control system, for the Bessemer process so as to obtain steel of a given carbon content with a significantly smaller number and duration of blows. The overall scheme is discussed and a description is given of a digital recording device for collecting data about the process.

CONTROL—GENERAL SYSTEMS

1033 **Determination of the second-order moments of various coordinates of automatic-control systems by the use of electronic analog computers.** L. A. Tel'ksnis, *Automn. & Remote Control* (Automatika i Telemekhanika in English), **21,** Feb. 1960, 153-155. An analogue computer method is presented for the determination of second order moments of various coordinates of automatic control systems by means of canonical representations of random functions. 6 refs.

1034 **The relative merits of incremental and conventional digital computers in air-borne real-time control.** S. M. Shackell and J. G. Tryon, *Commun. & Electronics,* No. 50, Sept. 1960, 393-400. This paper compares incremental computers (such as the digital differential analyser) with conventional digital computers and evaluates their relative merits for airborne real-time control systems. Factors considered include speed, logical and mathematical capabilities, accuracy, designability and maintainability, and reliability. It is concluded that the place of the incremental computer in airborne control is limited, but that incremental techniques may be used to provide functions which are unnatural to the conventional computer. 2 refs.

CONTROL—PRODUCTION AND PROCESS

1035 **The LN 300 computer control system.** K. G. Harple and R. G. Lex, *Commun. & Electronics,* No. 50, Sept. 1960, 408-413. This paper describes the overall design of the Leeds and Northrup LN 300 computer control system for industrial processes, which includes a general purpose, serial, internal binary, fixed-point, stored program digital computer designed and produced by Philco Corporation. 2 refs.

1036 **Messwertverarbeitungsgeräte und ihre Anwendung bei der automatischen Steuerung von Produktionsprozessen.** (Data handling equipment and its application to automatic control of manufacturing processes). J. Jardine, *Regelungstechnik,* **9,** March 1961, 97-103 (In German). English summary: "New concepts relating to the application of computers for industrial data handling systems will be much more easily understood if they are preceded by certain definitions and explanations. It is the purpose of this article to discuss generally the basic principles underlying the design of data handling equipment, to point out its advantages in comparison with the conventional measuring instruments and to describe its application as a most important member in a manufacturing process control loop." 3 refs.

1037 **Optimalwertregelung eines Sinterprozesses mit Hilfe eines Ziffernrechenautomaten.** (Optimising the control of a sinter process by means of a digital computer.) K.-J. Lesemann. **Regelungstechnik, 9,** Jan. 1961, 17-24 (In German). English summary: "A sinter plant is chosen as example to prove that it is possible, by using a digital computer for data processing and as a kind of superior control system, to obtain optimal process control conditions, dispensing with process equations. The method is described in detail. The advantages to be derived from the application of universal data processing equipment are pointed out."

ELECTRONICS

1038 **A computer program for simulating cryotron circuits.** M. K. Haynes, *Symposium on Superconductive Techniques for Computing Systems,* 1960, 353-365. It is desirable to be able to marginally test and debug assemblies of cryotrons by computer simulation before they are fabricated. Since the labour of writing differential equations for large networks is prohibitive, it is necessary that the computer perform this task from a tabular network description. This is accomplished by the use of tensor methods of network analysis developed by G. Kron. In order to solve for the transient behaviour of networks containing nonlinear elements, the simulation is by solution of the simultaneous differential equations by numerical integration by a digital computer. Kron's method has been adapted for finding the values of the quantities which are to be integrated and for performing the routine tensor operations involved in setting up the systems of equations from the input data. An IBM 704 program is outlined for simulating lumped inductive resistive circuits consisting of cryotrons. Studies with this program of a cross-latched cryotron flip-flop, a five-stage free-running ring circuit and a three-bit self-timing self-checking binary adder are described.

See also :—
Miscellaneous, Ref. 1070*c*, 1070*e*.

ENGINEERING, ELECTRICAL

1039 **Analog computer representation of an aircraft electric power generating system.** J. L. Klingenberger and R. W. Briggs, *Applns. & Industry*, No. 51, Nov. 1960, 402-406. This paper describes how system analysis, by means of analogue computer simulation, during the preliminary design of an aircraft a.c. power system eliminates repeated engineering and design changes resulting from unsatisfactory control performance at later stages in the development. 3 refs.

INFORMATION RETRIEVAL

1040 **Concepts of automatic data storage and retrieval in the Simplex system.** C. W. Uskavitch, M.I.T., *PB 152787,* 17 Oct. 1960, 67 p. Five guiding principles are inherent in the idea of a Simplex system for the Field Army: (1) the system should be independent of organisational structure; (2) it must handle large quantities of information with minimum delays; (3) it should provide service to as many units as possible; (4) it must be easily modified; (5) the system must fulfil the operational requirements of the Field Army. From these principles are derived the more concrete, but general, concepts required for design of the data storage and retrieval system. These concepts include such ideas as minimum human intervention, maximum utilisation of all equipments, modular construction, a common code for all information, and special purpose devices for such functions as error correction and security coding. A set of "black boxes" are postulated to provide an initial design of an apparently feasible storage and retrieval system. Each box is defined functionally in detail and a possible implementation technique is indicated. 12 refs.

1041 **Information retrieval and the design of more intelligent machines.** H. J. Gray and E. J. Parker, University of Pennsylvania, *PB 153597,* 30 June 1960, 77 p. A study of the operations involved in human cognitive process has resulted in an extension of the Newell-Simon Information Processing Languages to a multiple list data organisation where each data item appears only once in an addressable memory, yet the item has in it several descriptors with control information that place the data item in several lists. Such a system is well suited to information retrieval problems. A specification of a parallel-access information bank, which may be more efficient than the multiple-list system, has been prepared. Central to the list machine and the parallel-access information bank problem, is the problem of descriptor recognition. In this report, the problem is defined and progress towards its solution is stated. 8 refs.

MECHANICAL TRANSLATION

1042 **Research in machine translation. Russian into English: mathematical text.** H. H. Josselson and A. W. Jacobson, Wayne State University, *PB 149685,* 31 July 1959, 50 p. Contents: Linguistic problems associated with machine translation; Logical problems—The immediate constituent model, The transformation model; Computer considerations; Analysis of multiple meaning in mathematical text; Preparation of text for automatic data processing.

NUCLEAR

1043 **A digital nuclear reactor control system.** E. P. Gyftopoulos and P. M. Coble, *Applns. & Industry,* No. 51, Nov. 1960, 305-314. This paper is concerned with the problem of design of digital computer control systems for nuclear reactors. The study is based on a pressurised water type reactor such as that at Shippingport, Pennsylvania, U.S.A. Certain variables which can be used to describe the behaviour of the reactor and commands which can be used to control the reactor's behaviour are selected. An organisation of digital computer elements is then developed for calculating nonmeasurable variables from measurable variables and relating both types of variable to the control commands. A functional design of the necessary computer logic is carried out and the required register capacities, operation frequencies and scale factors are determined. 5 refs.

1044 **A multidecade linear reactor simulator.** J. W. Schwartzenberg, J. M. Finan, V. S. Underkoffler and R. N. Brey, *Commun. & Electronics,* No. 50, Sept. 1960, 353-358. This paper describes the analogue computer techniques used to accomplish a linear simulation of the neutron kinetics of the Experimental Boiling Water Reactor (EBWR) over a full operation range of 8 decades (100,000,000 to 1). 9 refs.

1045 **ART-04—A modification of the ART program for the treatment of reactor thermal transients on the IBM-704.** J. E. Meyer and W. D. Peterson, Westhinghouse Electric Corp., *WAPD-TM-202,* July 1960, 49 p.

1046 **The constant-period approximation for numerical solution of the space-independent reactor kinetics equations.** D. B. MacMillan, Knolls Atomic Power Lab., *KAPL-M-DBM-2,* July 1960, 8 p.

1047 **Digital computation of space-time variation of neutron fluxes.** E. L. Wachspress, General Electric Co., *KAPL-2090,* Oct. 1960, 33 p.

1048 **ECESS: An IBM-704 program computing transport equation coefficients for a monatomic gas moderator in the thermal energy region.** W. W. Clendenin and G. R. Culpepper, Westinghouse Electric Corp., *WAPD-TM-200,* April 1960, 33 p.

1049 **GAP: The IBM 704 grid analysis program.** F. J. Witt, Oak Ridge National Laboratory, *CF-60-4-69,* May 1960, 18 p.

1050 **54 group library for P-1 programs.** A. F. Henry, Westinghouse Electric Corp., *WAPD-TM-224,* April 1960, 118 p.

1051 **HFC: An IBM 704 digital computer program to calculate heat transfer data obtained from out-of-pile tests on fuel elements.** R. D. Burgess and C. L. Gregory, Knolls Atomic Power Lab., *KAPL-M-S3G-RES-70,* May 1960, 97 p.

1052 **HILO—A steady state reactor analysis program.** A. E. Kakretz and L. B. Shannon, Knolls Atomic Power Lab., *KAPL-M-DIG-TD-10,* April 1960, 108 p.

1053 **IBM 650 routine VI temperature distribution in fuel elements.** J. C. Jensen, E. I. du Pont de Nemours & Co., *DP-512,* Sept. 1960, 48 p.

1054 **An IBM-704 code for studying particle orbits in cyclotron fields.** H. C. Owens and T. A. Welton, Oak Ridge National Laboratory, *CF-59-11-3,* Nov. 1959, 113 p.

1055 **Model and equations for digital analysis of a mixed natural and forced circulation power plant.** A. J. Arker and T. R. Greene, Knolls Atomic Power Lab., *KAPL-M-NPA-9,* March 1960, 43 p.

1056 **Nuclear data tape program (IBM 704 Program NDTP).** K. A. Paine, General Electric Co., Aircraft Nuclear Propulsion Department, *APEX-574,* Dec. 1957, 30 p.

1057 **PDQ-3 A program for the solution of the neutron-diffusion equations in two dimensions on the IBM-704.** W. R. Caldwell, Westinghouse Electric Corp., *WAPD-TM-179,* May 1960, 56 p.

1058 **Reflector and pressure vessel cooling and thermal stress analysis on the IBM 650.** J. D. Love and R. L. Caton, Alco Products Inc., *APAE Memo-184,* March 1959, 37 p.

1059 **Renupak, an IBM-704 program for neutron moment calculations.** J. Certaine et al., Nuclear Development Corp. of America, *NDA-2120-3,* Dec. 1959, 22 p.

1060 **Sourceless startup—a machine code for computing low-source reactor startups.** D. B. MacMillan, Knolls Atomic Power Lab., *KAPL-M-DBM-1,* June 1960, 23 p.

1061 **A stability analysis of the finite difference representation of the energy equation.** D. C. Maxwell, Knolls Atomic Power Lab., *KAPL-M-DIG-TD-12,* May 1960, 55 p.

1062 **The tranmission matrix method for penetration problems.** D. Yarmush, J. Zell and R. Aronson. Technical Research Group Inc., *PB 171341,* August 1960, 299 p. A practical machine method for computing transmission and reflection of radiation by laminated slab shields is described, making use of transmission and reflection matrices. These are combined in a way which produces a formal solution of the Boltzmann equation in slab geometry. This result is applied by using representations in terms of energy groups and angular expansions. Two codes for the IBM 704 which together carry out the computation of the transmission and reflection matrices are described and operating instructions are given. Numerical results for gamma rays are presented. The advantages of the transmission matrix method as compared to other methods are discussed. 5 refs.

1063 **TRIP-1—A two-dimensional P-3 program in X-Y geometry for the IBM-704.** E. Gelbard et al., Westinghouse Electric Corp., *WAPD-TM-217,* July 1960, 21 p.

1064 **9-ZOOM—A one-dimensional, multigroup, neutron diffusion theory reactor code for the IBM 709. Part I. Theory and equations. Part II. Input and operating instructions. Part III. Test problem.** S. P. Stone et al., University of California, *UCRL-5682,* August 1959, 55 p.

SIMULATION

1065 **On methods of simulating rational-fraction functions without the use of differentiating elements.** B. Y. Kogan, *Automn. & Remote Control* (Automatika i Telemekhanika in English), **21,** Jan. 1960, 47-53. In this paper, four methods of simulating rational-fraction transfer functions without the use of differentiating elements when the original differential equations contain constant and variable coefficients are compared. The methods are: direct integration; recomposition of the transfer function into simpler ones; decomposition into first order equations; and combination of derivatives. For simplicity of the circuit and for minimum preliminary calculation, the method of combining derivatives is preferable for constant coefficients, and the method of transforming to first order differential equations is preferable when the coefficients are variable. 6 refs.

1066 **Simulation Council Newsletter.** J. H. McLeod (Ed.), *Instr. & Control Systems,* **34,** March 1961, 487, 489, 491, 495. A brief account is given of the Rocky Mountain Simulation Council meeting of 5th December 1960, which included talks on a Euler angle conversion computer, a special purpose computer for determining transfer function coefficients, and methods for simulation of electronic environment and radar systems. The major portion of the Newsletter is devoted to summaries of extracts from the following papers presented at the Eastern Simulation Council meeting of 12th December 1960: "Utilizing the operational amplifier with dynamic storage as a general-purpose non-linear element" by J. M. Andrews; "Solutions of bounded Fourier integrals on the Dystac computer" by J. M. Nelson and S. Fried; "A non-linear programming technique for analog computation" by J. H. Moser, C. O. Reed and H. L. Sellars; "Application of repetitive operation and dynamic storage to industrial process control system design" by B. H. Baldridge and G. V. Wagoner.

TRANSPORT

1067 **A digital computer simulation of single-track railroad operation.** R. T. Coupal, L. L. Garver and W. R. Smith, *Applns. & Industry,* No. 50, Sept. 1960, 236-240, disc. 240-241. An account, including a flow diagram, is given of an IBM 650 program for predicting the traffic pattern of up to ten trains operating on a 100-150 mile division of a railroad. The object of the program is to aid in the selection of siding locations and signal spacing for a single mains track with centralised traffic control. 1 ref.

MISCELLANEOUS

1068 **The Automatic Meteorological Observation Station (AMOS) computer.** *Computers & Automn.,* **10,** March 1961, 12, 14. General account of the AMOS IV computer developed by the National Bureau of Standards in cooperation with the U.S. Weather Bureau for use as a research tool in exploring the concept of the automatic weather station. The computer processes data from meteorological instruments through such functions as sampling, comparing, selecting a maximum and arithmetic operations. 3 refs.

1069 **The automation of an election.** B. Higman, *Computer Bull.,* **4,** March 1961, 154-156. After a description of the "proportional representation by the single transferable vote" system for election of the members of a committee, a weakness in the manual counting method is explained and it is shown how this weakness can be eliminated by means of modern data handling methods. The paper then presents an ALGOL procedure for effecting a proportional representation count.

1070 **Novel applications of computers.** N. Macdonald, *Computers & Automn.,* **10,** March 1961, 6-8. Consists of the following, together with a request for information about other novel applications of computers:

a. **Digital computer instead of stable platform in inertial navigation systems.** S. H. McAloney, p. 6. Brief account of two new special purpose digital computers being designed and built by Ford Instrument Company as part of the AN/AJN-7 "strapped-down" inertial navigation system.

b. **"Writing letters" on past due accounts.** W. R. Platt, p. 6-7. Brief description of the use of an NCR 304 to prepare letters to customers with overdue accounts.

c. **"Suggesting improvements" in the design of circuits and other engineering work.** J. R. Lamb, p. 7. Brief description of the use of an LGP-30 to check the reliability of circuits and re-design when necessary.

d. **Voice reporting of current stock prices upon interrogation.** W. Clark, p. 7. Brief description of a data processor being built by Teleregister Corporation to report stock quotations over the telephone to brokers of the American Stock Exchange.

e. **A coordinate conversion computer for Project Echo.** J. V. Cockin, p. 7-8. Account of a coordinate conversion computer developed by Computer Control Co., Inc., for continual positioning of two 85-foot parabolic aerials to track the orbiting satellite of Project Echo.

f. **Aptitude testing and answer timing by use of a computer in real time,** p. 8. Brief description of a Bendix G-15D computer program developed by Wolf Research and Development Corporation for administering multiple-choice tests as an aid in the selection of computer programmers.

1071 **Some problems and approaches to automation of medical diagnosis.** P. A. Smith, *Behavioral Science,* **6,** Jan. 1961, 88-91. The possibilities of using a computer to process large amounts of data as an aid to diagnosis are reviewed. Other medical applications such as retrieval of pharmaceutical information, evaluation of clinical trials of new drugs, and hospital administration are briefly considered. 8 refs.

1072 **Issues in the use of an analog-digital data system for the measurement of tracking behavior.** C. E. Webber and J. A. Adams, University of Illinois, *PB 152703,* April 1960, 38 p. Tracking data collected by an analogue-digital data system and processed with a digital computer is recommended as a solution for certain research restraints imposed by the traditional methods of measuring tracking behavior. An experiment on system parameters performed entirely on a digital computer, evaluated sampling rate and number of digits per reading of simulated tracking error functions for time on target measures. The Sampling Theorem recommending a sampling rate twice that of the highest component frequency in the analogue signal is sound for time on target computations, but somewhat lower rates appear acceptable for many applications. Empirical tracking data obtained with an analogue-digital data system is presented. 6 refs.

1073 **Mathematical model and digital computer program for vehicle firing stability analysis (active suspension).** C. M. Fischer, Dynamic Simulations Lab., Ordnance Tank-Automotive Command, Center Line, Michigan, *PB 152845,* 12 July 1960, 82 p. This report describes the establishment of a mathematical model and digital computer procedure for conducting comprehensive firing stability studies of vehicle mounted weapon systems. Program results include vehicle vibration, acceleration, velocity and displacement data at any time increment during the application of the gun firing force impact. 2 refs.

1074 **West Ford coordinate conversion program.** W. R. Crowther, M.I.T., *PB 153053,* 1 Nov. 1960, 7 p. A program has been written to accept points in radar coordinates and convert them to points in an earth-centered non-rotating system. This program will be used to modify the output of the Point Selection program to an acceptable input of the Orbit Determination program.

BOOKS

1075 **Symposium on Superconductive Techniques for Computing Systems.** ONR Symposium Report ACR-50 (PB 161763), Office of Naval Research, Department of the Navy, Washington D.C., 1960, vii+413 p., $4.50. Contains the papers presented at the Symposium on Superconductive Techniques for Computing Systems held in Washington D.C., from 17th to 19th May 1960. For abstracts of these papers see Refs. 845, 919, 945, 946, 947, 949, 950, 951, 952, 955, 956, 957, 958, 960, 961, 962, 966, 969, 970, 971, 972, 973, 977, 978, 979, 980, 981, 985, 986, and 1038.